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## Some new reflections on Mr. Palomar

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**Abstract.** The character Mr. Palomar, the alter-ego of the Italian author Italo Calvino, appeared for the first time in 1975 on the pages of the “Il Corriere della Sera”, and then more or less regularly till its debut as a book in 1983. Through illuminating thoughts and reflections based on observations, for instance, of sea waves, Mr. Palomar discovers that they induce a peaceful and inspirational state of mind that prevents coronary and mental illnesses, and also holds the key to capturing the complexity of the world reducing it into its most elementary mechanisms. In this contribution I will survey some of Mr. Palomar’s thoughts while he observes the sky and speculate on others that he might have explored if he shared our contemporary knowledge of the cosmos. I will also discuss the thoughts of other authors on how, cosmological thinking affects the human condition.

### 1. Cosmology and “cosmo-vision”

An impressive body of experimental and observational facts, models, conjectures and hypotheses give shape to our current cosmo-vision – “Weltanschauung”. This evidence arises from a wide variety of sources including astronomy, physics, chemistry, geology, paleontology, biology, genetics, archeology and history, providing a most exciting and vivid picture of humankind and the Universe’s evolution. Most likely, this laborious work of gathering ideas and observation supporting this cosmo-vision, which took various generations of researchers many years and that will likely last many more in the foreseeable future, is one of the highest achievements of human endeavour. It allows for the understanding of the articulation of a variety of “origins”, from the origin of the Universe to the emergence of life on Earth and its subsequent evolution, to the first human social formations (see (Bertolami 2006a) for a discussion).

Studies of the Cosmic Microwave Background Radiation (CMBR) and theoretical cosmology allow estimating the age of the Universe as about 13.7 thousand million years (Gys). The CMBR corresponds to the surface of last scattering, when the Universe turned transparent to electromagnetic radiation (and the approximate time of transition from the early dominance by the density energy of radiation to the dominance of matter), about 370 thousands years after the Big Bang. The first galaxies and stars were formed about 10 Gys ago. Radiative dating allows estimating the age of Earth and Solar System as about 4.5 Gys. Evidence arising from dating of stromatolite’s fossils suggests that life on Earth appeared 3.6 Gys ago. The first macroscopic organisms first appeared about

700 million years ago. The tectonic sea-floor spreading which resulted in the Atlantic ocean took place about 100 million years ago. Our primate ancestors first walked on two legs about 3 million years ago. The first human socio-cultural formations appeared 40 thousand years ago and the first human artistic imagery, impressive cave and rock paintings and rock art found in Europe and Australia, date back to 15 to 45 thousand years.

It is quite evident that technological developments have also shaped and conditioned the evolution of humankind, most notably from the XIX century onwards. Most likely, this development will be even more conspicuous in the future. Nevertheless, however special it might be (see contributions by Joel Primack and Nancy Abrams), the impact that the discovery of our modest standing in the Universe is much less apparent in our culture. Still, strong arguments can be put forward that science, and cosmology in particular, do permeate our culture. This can be observed in contemporary art, science fiction, cinema<sup>1</sup>, music and so on. A “visual poetry” inspired by a cosmic view can be recognized in many ancient cultures (see intervention of Chanda Carey). Literature, specially contemporary literature, is receptive to the appeal of cosmology. I will concentrate on some examples I find particularly representative.

Pessimism about our cosmic condition and about the emergence of life can be found in the writings of important authors. In one of his well known essays, Bertrand Russell (1872 – 1970) is quite emphatic about the influence that the knowledge of catastrophic cosmic events and the inevitable death sentence on the Universe and human achievements as a result of the Second Law of Thermodynamics (Russell 1957):

*“ ... all the inspiration, all the noonday brightness of the human genius are destined to extinction in the vast death of the solar system, and the whole temper of Man’s achievement must inevitably be buried beneath the debris of a universe.”*

Rather against the current anthropic reasoning, which argues in favour of the near inevitability of the emergence of life in the Universe in light of examples like the recent discovery of a profusion extra-solar planets<sup>2</sup>, Nobel laureate, French biologist, Jacques Monod (1910 – 1976) expresses his utter pessimism (Monod 1972):

*“... The Universe was not pregnant with life nor biosphere with man. Our number came up in the Monte Carlo game ...  
then man must at last wake out of his millinery dream, and in doing so wake to his total solitude, his fundamental isolation ...  
Man knows at last that he is alone in the unfeeling immensity of the universe, out of which he has emerged only by chance.”*

In a contrasting tone, I find, no author has discussed the influence of the physical world in such an optimistic and rather analytic way than the Italian

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<sup>1</sup>The scene of a boy in one of Woody Allen’s films refusing to eat because the Universe was expanding is one that strikes quite vividly my memory.

<sup>2</sup>An infinite number of worlds was defended by Giordano Bruno (1548 – 1600), as the only way to God exert his omnipotence (Giordano Bruno 1584). For this heretical view he was burnt at the stake at the Market of Flowers in Rome in 1600.

author Italo Calvino (1923 – 1985). The character in question is Mr. Palomar<sup>3</sup>, after the mountain where the famous Hale telescope in California enabled remarkable discoveries about the Universe from the late 1940s until 1980s. Mr. Palomar, in a broad sense, the alter-ego of the Italian author himself, appeared for the first time in 1975 on the pages of the “Il Corriere della Sera”, and then somewhat regularly until appearing as the central figure in a book as simply “Palomar” (Calvino 1983).

Mr. Palomar thoughts and reflections are quite original and illuminating, arising through observing the natural world (physical and biological), as well as when sensing the sociological difficulties of our day to day life. Actually, it is rather unique the way he concludes that human relations should necessarily mirror the Universe in order to improve.

In the chapter, “Palomar sulla spiaggia” and, in particular, in the subsection “Lettura di un’onda” (Palomar on the beach - The reading of a wave), the character discovers, for instance, that the observation of the waves in the sea, not only induces a peaceful and inspirational state of mind, but also that it holds the key to capturing the complexity of the world reducing it into its most elementary mechanisms.

*“... One cannot observe a wave without taking into account the complex aspects (velocity, shape, direction) that conspire to form it. The factors are always changing so that every wave is different than any other, but it is also true that they are equal to each other ...”*

In the chapter Palomar in the garden, (“Palomar in giardino”), and in the subsection on the loving making of the tortoises, (“Gli amori delle tartarughe”), the character reflects on the extraordinary forces of biological attraction and the complication it represents for certain species, including our.

In Palomar looks at to the sky, (“Palomar guarda il cielo”), the character draws his conclusions when observing the moon in the afternoon, the motion of the planets and the shining of the stars (“Luna di pomeriggio”, “L’occhio e i pianeti”, “La contemplazione delle stelle”). These conclusions are not always correct from the physics point of view, but nevertheless original and insightful. Actually, he remarks that the contemplation of the stars requires a great effort, as one should be properly equipped with a telescope, a chart of the constellations, a lamp, etc. He refers to the Milky Way as “the terrible shining silvered cloud”. His disquiet about the distance separating the objects in the sky is evident, as they are beyond our understanding. Moreover, he claims that the observation of the stars induces unstable and contradictory feelings as it suggests a too complex relationship between harmony and evolution. And rather remarkably:

*“The uncertainty about the distance of the luminous bodies leads one to trust only on the dark! What could be more stable than nothing?”*

I think that Calvino would be quite pleased to hear that recent discoveries suggest that the real dynamics of the cosmos is actually ruled by dark entities, dark energy, on the largest scales, and dark matter, on galactic and galaxy cluster’s scales. The simplest candidate for dark energy, and for some the most natural, is actually the vacuum energy density, “nothing” if one assumes that

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<sup>3</sup>Other writings of Calvino on the Universe, include “Le cosmocomiche” (1965), “Ti con zero” (1967), “La memoria del mondo e altre storie cosmocomiche” (1968).

the “void” refers to the absence of matter that does not manifest itself in the electromagnetic spectrum, or that cannot be observed through, for instance, neutrino detectors.

In the chapter *Universe as mirror* (“L’Universo come specchio”), Palomar calls for a “cosmological thinking” in order to improve our lives. His point is that his suffering when weighting the difficulties in his relationships with others, would improve if his relationship with the Universe were closer. He argues that despite the infinite combinations, permutations and chain of consequences, all events in the Universe remain and that should be the basic underlying feature of human relationships! Palomar goes as far as, to quote as an example, the explosion of a supernova at the Magellanic Cloud as an event that took place long ago, but that is still there, to be seen, admired and discussed. One can see that as an incredible premonition of the SNe 1987a event, precisely at the Magellanic Cloud!

Let us now turn to another author, the Argentinian Ernesto Sábato (1911). The expansion of the Universe is one of the central issues of discussion in the “*Uno y el Universo*” (One and the Universe) (Sábato 1945).

Being a physicist by training, the discovery of the expansion of the Universe could not fail to impress him. He was aware of the pioneering work of Einstein, who in 1917 defended the idea of a static Universe, and of his Dutch colleague Willem de Sitter, who in the same year showed that a Universe dominated by the cosmological term introduced by Einstein to keep the Universe at bay, actually, would not do the job! He was also aware of the 1922 evolving solution of the Russian engineer Alexander Friedmann and the subsequent discussion and solutions by the Belgium priest George Lemaître from 1924 onwards<sup>4</sup>.

Suspicious of purely theoretical constructions to explain the expansion of the Universe, as suggested for instance by the British astronomer Arthur Eddington (Eddington 1936), he expresses also reservations about purely empirical evidence.

These concerns are ingeniously exemplified through an analogy with ichthyology. The example goes as follows: through the repeating process of collecting fish with a catch with a spacing of 5 cm an ichthyologist acquires knowledge that he/she expresses in terms of two laws:

- 1) There are no fish smaller than 5 cm long.
- 2) All fish have gills.

From a strictly scientific point of view, any natural scientist would argue that fish belong to the physical world, that a fellow ichthyologist is a well intentioned and competent scientist, and the catch is the cognition apparatus. However, from the point of view of a skeptic, the first law is just a consequence of the net employed and hence the validity of the second law might be in question.

To this criticism, a hard core ichthyologist would counter argue that fish that cannot be caught with the available net are beyond ichthyology’s knowledge. They belong to metaphysics. Science is built upon observable entities. Of course, on purely epistemological terms one might argue that the first law could be concluded through the examination of the catch, without the need of

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<sup>4</sup>See (Farrell 2005) for a thorough discussion of the historical developments which led to the idea of the “day without yesterday”, the Big Bang.

any empirical work; moreover, by the same order of arguments, the second law may also fail as one cannot fish in all waters.

However, it is clear that there is a fundamental difference between physics and ichthyology. In the former, it seems possible to acquire knowledge through purely theoretical epistemological methods. Indeed, special and general relativity are above all intellectual constructions. The same can be said about quantum mechanics and, in particular, about its most fundamental characteristic feature, the Uncertainty Principle.

As already mentioned, modern cosmology is a brain child of general relativity and recent developments such as inflation and the subsequent imprinting it leaves on the cosmic microwave background radiation were essentially driven by theoretical problems, both in theoretical cosmology (the horizon and the flatness problems, and the origin of structure) and in high energy physics (the overabundance of magnetic monopoles). The attempt to unify all interactions of nature in a single and encompassing scheme is a purely theoretical programme. Its most developed proposal, superstring theory/M-theory does bring about, as any original theoretical construction, a fairly new view of the Universe. Actually, it seems to suggest a multiverse (see (Bousso & Polchinski 2000), (Susskind 2005), (Bertolami 2006b), (Bertolami 2008) for discussions).

However, reality has always the final word and is its quite exciting when surprising or unexpected possibilities emerge from the observations. The recent discovery of the current accelerated expansion of the Universe falls precisely in this category.

## 2. The Universe as the framework for literature

For many authors, the Universe, with its laws and dynamics, is an active framework for literary expression. Furthermore, attempts to understand how the Universe works are seen by some authors as guidelines for ethics. For instance, in the "O Homem Duplicado" (2002) (The Duplicated Man), the Nobel laureate Portuguese author, José Saramago (1922), asserts the significance of the literary work based on the existence of a cosmic equilibrium (Saramago 2002):

*"... the conventional tradition of the romance, is not after all, just a somewhat wasted descriptive attempt due to the scarcity of imagination, but actually a literary result of the majestic cosmic equilibrium, given that the universe is, since its origins, a system without any organizational intelligence, but that had enough time to learn with the infinite multiplication of its own experiences, so as to abundantly demonstrate that the performance of life is an infinite machinery of compensation, within each any delay of a minute, an hour, a century is irrelevant."*

The failure to assign a clear cut moral sense from descriptions of the origin of the cosmos is attributed to the lack of consensus around any particular cosmogony (Saramago 2002):

*"... It leads one thinking that as all cosmogonies invented since the birth of the word failed so miserably, it does not mean any good in what concerns their implications for our behaviour."*

It is interesting to speculate whether Saramago's opinion would change if introduced to the most recent developments in cosmology and with how obser-

vational discoveries can be harmonized in the context of the Big Bang model. This author suspects that not significantly.

Fernando Pessoa (1888 – 1935) was the dominant figure of the Portuguese literature in the first half of the XX century. Multiple literary personas manifest themselves as “heterónimos”, Fernando Pessoa, Álvaro de Campos, Ricardo Reis, Alberto Caeiro, Bernardo Soares, Barão de Teive, Alexander Search, etc. (actually 19 ones) through fairly distinct styles (Pessoa 1965). Beyond doubt a unique example in world literature. His work was only partially published during his lifetime. This rather singular situation has given origin to a great deal of posthumous publications and quite often to the discovery of unknown poems and sometimes even whole manuscripts - even though, most often, not completely finished. Rather recently, a new poem by Alberto Caeiro, the naive and symbolic poet, was found. I present (and translate) one transcription of this poem, which can be regarded as an “ode” to the Big Bang:

*“I like the sky because I believe it is finite.  
How could something that has neither a beginning nor an end have anything to do with me?  
I do not believe in infinity, I do not believe in eternity.  
I believe that space starts somewhere and ends somewhere.  
Beyond and before that there is absolutely nothing.  
I believe that time has a beginning and an end.  
Before and after that there was no time.  
Why any of this should be false? It is false to talk about infinities,  
As if we know what they are and if we can understand them.  
No: everything is a finite quantity of things.  
All is well defined, all has limits, all is made up of things.”*

### 3. A cosmic inspired ethics?

In ancient cultures, given the historical development of a civilization was regarded as a continuation into the human sphere of a cosmogony which took place in the natural world. The fact that the latter occurred through a divine intervention would automatically associate it with a well defined set of religious and ethical values. Cosmology and religion were once quite intertwined. This is evident in the context of the great religions, and this connection can also be found in many other cultures.

Let me illustrate this relationship, through an example based on a passage of the cosmology of the Mande peoples (Danielle & Olivier Föllmi 2005), an ethnic group of West Africa. Speakers of the Mande languages are found in Gambia, Guinea, Guinea-Bissau, Senegal, Mali, Sierra Leone, Liberia, Burkina Faso, Ivory Coast and the northern half of Ghana:

*“When the Everlasting addressed man, He taught him the law by which all elements of the Cosmos were formed and continue to exist. He made man Guardian and Governor of His universe and charged him supervision and maintenance of universal Harmony. That is why man is a heavy responsibility.”*

In my view, the key words in this example are *universal Harmony* and *responsibility* and I believe that the emphasis on these two concepts is particularly

appealing as they open the possibility of considering a “cosmic ethics” without relating it to a religious view of the world. If so, the question is if cosmology can be the cornerstone for an ethics of responsibility. From a strictly scientific point of view, the answer is clearly negative. Scientific developments were achieved independently from humanistic and anthropocentric concerns. The scientific facts that describe and allow for understanding the existence and dynamics of Earth, home of humankind, are a particular limit of a general set of laws that govern the whole Universe. It is therefore, somewhat improper to ask for the implication that research on the infinitely large (and equally well on the infinitely small) might have, on philosophical and ethical terms, for the future of humankind. Moreover, cosmology does provide, more vociferously than any other subject, a clear perspective of the modest standing of humankind within the picture of the cosmos. Nevertheless, cosmology does render us with a view of how unique, and this is a rather anthropocentric interpretation, are the conditions required to shelter life and, in particular, sentient and reflective life. Even though it is a firm belief of this author that life is a wide spread phenomenon in the Universe, humankind is most likely quite unique within the family of self-conscious species that exist throughout the Universe. We have therefore, a responsibility to keeping the balance of our world and ensure its continuity. A responsibility with a time arrow pointing towards the future, but that is necessarily based on lessons learned from our history, personal and collective.

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### References

- Bertolami O. 2006a, “O Livro das Escolhas Cósmicas”, (Gradiva, Lisboa 2006).  
 Bertolami O. 2006b, “The Adventures of Spacetime”. Chapter in the book *Relativity and the Dimensionality of the World* in the Springer series *Fundamental Theories of Physics* edited by V. Petkov; gr-qc/0607006.  
 Bertolami O. 2008, *Gen. Rel. Grav.* **40** (2008) 1891.  
 Bousso R. and Polchinski J., *JHEP* **0006** (2000) 006.  
 Bruno G., “Acerca do Infinito, do Universo e dos Mundos”, (Fundação Calouste Gulbenkian, Lisboa 1978).  
 Calvino I., “Palomar” (Oscar Mandadori, Milano 1994).  
 Eddington A. , “Relativity Theory of Protons and Electrons” (Cambridge University Press, Cambridge 1936).  
 Farrell J., “The Day Without Yesterday, Lemaître, Einstein, and the Birth of Modern Cosmology” (Thunder’s Mouth Press, New York 2005).  
 Föllmi D. & O., “African Wisdom 365 Days” (Thames & Hudson, London 2005).  
 Monod J., “Chance and Necessity” (Collins/Fount, Glasgow 1972).  
 Pessoa F., *Obra Poética* (Aguilar Editora, Rio de Janeiro 1965).  
 Russell B., “Why I am not a Christian and other essays” (George Allen & Unwin, London 1957).  
 Sábato E., “Uno y el Universo” (Buenos Aires, 1945).  
 Saramago J., “O Homem Duplicado”, (Editorial Caminho, Lisboa 2002).  
 Susskind L., “The cosmic landscape, String theory and the illusion of intelligent design” (Little, Brown, New York 2005).